

DETAILED ACTION

1. This office action is in response to an amendment filed on 6/30/2010.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 14, 18-19, 21-22, 26-34, 36-27, 41, 45-46, 48, 50-52 and 54-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoekstra (US 6,420,678) in view of Manor (US 2001/0035401) and further in view of Umehara et al (Umehara, US 5,882,956).

With regard to claims 14,18-19, 26, 33,41, 45, 48 and 50-51, 57-60 Hoekstra teaches a laser processing method comprising the steps of: irradiating an object 4 (Fig.4) to be processed comprising a substrate 4 (Fig. 4, col. 5, lines 45-65) with laser

Art Unit: 2892

light 34 (Fig. 4) while positioning a light-converging point 35 (Fig. 4, laser light converging through lens 35) at least within the substrate 4 (Fig. 4), the substrate 4 modified region forming a starting point region 37 for cutting the object inside the object at a predetermined distance from a laser light incident face of the object 4 (col. 65+ to col. 6, lines 1+); and cutting the substrate 4 (col. 6, lines 40-50 see also Fig. 4 with respect to Fig. 16) along when a fracture (col. 6, lines 5-15) generated in a thickness direction of the substrate 4 (Fig. 16 with respects to Fig. 4) from the starting point region reaches a front face and a rear face of the object 4 (col. 6, lines 10-15).

Hoekstra expressly fails to teach a laminate part disposed on a front face of substrate and cutting the laminate part and the laminate part having at least one semiconductor device and in order to provide at least one manufactured semiconductor device and the modified regions formed within the substrate and the laminate part overlap with each other along the line when viewed from the thickness direction and after completion of forming the substrate modified region applying a stress to the object which causes cutting the substrate.

Manor teaches cutting a substrate 100 (Fig. 3A) with a laminate part 106 disposed on a front face of substrate 100 [0036] and the laminate part having at least one semiconductor device ([0007] wherein semiconductor wafer 100 comprises plurality of chips on the wafer 100) and in order to provide at least one manufactured semiconductor device [0007] and the laminate part overlap with each other along the line when viewed from the thickness direction (Fig. 3A, wherein laminate part 106 is overlaps if viewed from thickness direction). At the time the invention was made, it

Art Unit: 2892

would have been obvious to a person having ordinary skill in the art to cut substrate with laminate on the face of the substrate teaching of Manor in laser processing method of Hoekstra, because such laminate part e.g. coating on surface of substrate helps to minimize chipping and improve device yield as taught by Manor in [0034].

Umehara teaches applying a stress (col. 3, lines 40-45 e.g. expanding the sheet 10) to the object (10 in Fig. 10 e.g. sheet) which causes cutting the substrate. At the time the invention was made, it would have been obvious to a person having ordinary skill in the art substitute Hoekstra's expandable bonding sheet 112 with teaching of Umehara's expanding bonding sheet 10 include a bonding layer 4 in the substrate dividing method of Hoekstra because such bonding layer e.g. layer 4 can be used as a interposed between the IC chips and the lead frame to thereby bond the IC chips to the lead frame thus reduce additional bonding steps as taught by Umehara in (col. 1-10).

The recitations of "so as to form a substrate modified region due to multiphoton absorption only within the substrate" is only a statement of the inherent properties of the instant process of Nd:YAG laser pulse. The process recited in "laser processing e.g. ND: YAG" is substantially identical (instant application laser process e.g. Nd:YAG laser see specification page 26) to that of the claims, claimed properties or functions are presumed to be inherent. Or where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977) and MPEP 2112.02.

Art Unit: 2892

With regard to claim 21, Hoekstra teaches a laser process method wherein the substrate modified 37 (Fig. 4) region includes at least one of a crack region (col. 6, line 20) which is a region where a crack is generated within the substrate 4 (Fig.4), a molten processed region which is a region subjected to melting within the substrate, and a refractive index change region which is a region with a changed refractive index within the substrate.

With regard to claim 22, Hoekstra teaches a laser process method wherein the laser light irradiating the substrate 4 while positioning the light-converging point 35 therewith irradiates the substrate 4 from the rear face thereof (col. 6, lines 5-10, wherein laser can be applied on both end).

With regard to claim 27, Hoekstra teaches a laser processing method, wherein the substrate 4 modified region (where void 37 is located) is formed within the substrate 4 (Fig. 4) such that the substrate modified region shifts from the center position of the object in the thickness direction toward a rear face of the substrate 4 (col. 4, lines 40-50).

With regard to claim 28, Hoekstra teaches a laser processing method further comprising the step of applying stress (col. 4, lines 45-50 by tensile forces) to the object 4 after the step of forming the starting point region (wherein void 37 is formed) for cutting, so as to cut the object 4 (col. 4, lines 45-50) along the line 45.

Hoekstra fails to teach step applying stress to the object from the laminate part side.

Art Unit: 2892

Manor teaches step applying stress to the object from the laminate part side 106 (Fig. 3A and 3B, wherein laser been irradiate to create stress on the laminate part side). See claim 14 discussion for combination.

With regard to claim 29, Hoekstra teaches a laser processing method wherein the substrate modified region (wherein void 37 is formed) is formed within the substrate 4 (Fig. 4) such that the modified region shifts from the center position of the object in the thickness direction toward the front face of the substrate 4 (col. 6, lines 5-15, wherein laser beam can apply to one side to other side).

With regard to claim 30, Hoekstra teaches a laser processing method further comprising the step of applying stress (col. 11 , lines 10-20 wherein stress is generated on bottom side of the substrate by a small rise in the elevations at the locations where the substrate 4) to the object 4 (Fig. 4 with respect Fig. 16) from the opposite side of the laminate part (see claim 14 discussions wherein laminate part is formed on face of the substrate) after the step of forming the starting point region for cutting, so as to cut the object along the line 45 (Fig. 16).

With regard to claims 31-32, Hoekstra teaches a laser processing method wherein the substrate 4 is a plurality of substrates (col. 10, lines 50-55) formed while abutting (Fig. 16) the modified regions formed within the substrate 4 (Fig. 4).

Hoekstra fails to teach laminate part and the substrate and the laminate part are a plurality of substrate attached to each other while forming a gap there between.

Manor teaches laminate part and the substrate and the laminate part is a plurality of substrate attached to each other while forming a gap there between (Fig. 4C wherein

Art Unit: 2892

laminate part 106 and substrate 100 are attached while gap 350 is formed). See above claim 19 discussions for the combination).

With regard to claims 34 and 36, Hoekstra teaches a laser processing method wherein the object comprises the substrate 4 (Fig. 4), but fails to teach a laser processing method wherein the object comprises the laminate part, the laminate part includes a first laminate part which is an oxide film disposed on the front face of the substrate and a second laminate part disposed on a front face of the first laminate part and the laminate part which is a laminated functional film.

Manor teaches a laser processing a laser processing method wherein the object comprises the laminate part (106), the laminate part includes a first laminate part which is an oxide film [0008] disposed on the front face of the substrate 100 and a second laminate part disposed on a front face of the first laminate part ([0008] wherein layer 106 is comprises various layer include passivation oxide layer) and the laminated part which is a laminated functional film ([0008] wherein one of the various can be used as functional film). See claim 14 for combination.

With regard to claim 35, Hoekstra teaches a laser processing method wherein the object comprises the substrate 4 (Fig. 4) which is a glass substrate (col. 4, lines 25-30), but Hoekstra fails to teach the laminate part which is a glass substrate.

Manor teaches a laminate part 106 with various layer e.g. passivation oxide [0008] which equals to glass substrate). See above claim 14 discussions for the combination

Art Unit: 2892

With regard to claim 37, Hoekstra teaches a laser processing method further comprising the step of cutting the object 4 along the line 45 from the starting point region for cutting (Fig. 4 with respect to Fig. 16).

With regard to claims 52 and 54-56, Hoekstra teaches a method of manufacturing a semiconductor device wherein the object 4 (Fig. 4) is irradiated with laser light 34 while positioning a light- converging point 35.

Hoekstra fails to teach form a laminate part modified region within the laminate part in the irradiating step, and the substrate modified region formed within the substrate and the laminate part modified region formed within the laminate part are separated from each other.

Manor teaches cutting a substrate 100 (Fig. 3A) with a laminate part 106 disposed on a front face of substrate 100 [0036] after forming the starting point (see [0036] wherein a laser can be irradiate below coating layer to create starting point) and the laminate part modified region formed within the laminate part are separate from each other ([0036] wherein the laminate part and modified e.g. laser sport on the substrate 100 are separate from laminate part). At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to cut substrate with laminate on the face of the substrate teaching of Manor in laser processing method of Hoekstra, because such laminate part e.g. coating on surface of substrate helps to minimize chipping and improve device yield as taught by Manor in [0034].

5. Claims 23, 39 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoekstra (US 6,420,678) and in view of Manor (US 2001/0035401) of record.

Art Unit: 2892

With regard to claims 23, 39 and 46 Hoekstra teaches a laser processing method comprising the steps of irradiating a substrate 4 (Fig. 4) with laser light 34 while positioning a light converging point 35 within the substrate 4 (Fig.4), so as to form a modified region 37 only within the substrate 4, the modified region 37 forming a starting point (wherein void 37 is formed) region for cutting the substrate 4 at a predetermined distance (Fig. 4) from a laser light 34 incident face of the substrate 4; and cutting the substrate 4 and along a line 45 (Fig. 4 with respect to Fig. 16) when a fracture generated in thickness direction of the substrate 4 (col. 55-60) from the starting region (wherein void 37 is located) reaches a rear face of the substrate 4 (col. 4, lines 35-47) wherein the substrate modified region formed within substrate 4 (Fig. 4).

Hoekstra expressly fails to teach providing a laminate part on a front face of the substrate after forming the starting point region and cutting the laminate part and fracture reaches front face of the laminate part and the laminate part modified region formed within the laminate part are separate from each and provide at least one manufactured semiconductor device.

Manor teaches cutting a substrate 100 (Fig. 3A) with a laminate part 106 disposed on a front face of substrate 100 [0036] after forming the starting point (see [0036] wherein a laser can be irradiate below coating layer to create starting point) and the laminate part modified region formed within the laminate part are separate from each other ([0036] wherein the laminate part and modified e.g. laser spot on the substrate 100 are separate from laminate part) and provide at least one manufactured semiconductor device [0007]. At the time the invention was made, it would have been

Art Unit: 2892

obvious to a person having ordinary skill in the art to cut substrate with laminate on the face of the substrate teaching of Manor in laser processing method of Hoekstra, because such laminate part e.g. coating on surface of substrate helps to minimize chipping and improve device yield as taught by Manor in [0034].

6. Claims 15-17, 24-25, 42-44 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoekstra (US 6,420,678) and in view of Manor (US 2001/0035401) and further in view of in view of Piwczyk et al. (6,376,797) and further in view of Umehara et al (Umehara, US 5,882,956) all of record.

With regard to claims 15-17, 24-25, 38, 42-44 and 49 Hoekstra teaches a laser processing method comprising the steps of: irradiating an object to be processed comprising a substrate 4 (Fig. 4) and with laser light 34 (Fig. 4) while positioning a light-converging point 35 at least within the substrate 4 under a condition with a pulse width of 1 us or less (col. 6, lines 26-30), so as to form a substrate modified region including a crack region (col. 6, lines 5-15) within the substrate 4 the substrate modified region (wherein void 37 is formed) forming a starting point region for cutting the object inside the object at a predetermined distance from a laser light incident face of the object 4 (Fig. 4, col. 6, lines 1-15); and cutting the and the laminate part along a line 45 (Fig. 16) when a fracture generated in a thickness direction of the substrate from the starting point region for cutting reaches a front face and a rear face of the object 4 (col. 6, lines 10-15).

Hoekstra expressly fails to teach a laminate part disposed on a front face of substrate and cutting the laminate part and the laminate part having at least one

Art Unit: 2892

semiconductor device and in order to provide at least one manufactured semiconductor device and laser light while positioning a light-converging point at least within the substrate under a condition with a peak power density of at least 1×10^8 (W/cm²) and applying a stress to the object which causes cutting the substrate.

Manor teaches cutting a substrate 100 (Fig. 3A) with a laminate part 106 disposed on a front face of substrate 100 [0036] and the laminate part having at least one semiconductor device ([0007] wherein semiconductor wafer 100 comprises plurality of chips on the wafer 100) and in order to provide at least one manufactured semiconductor device [0007]. At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to cut substrate with laminate on the face of the substrate teaching of Manor in laser processing method of Hoekstra, because such laminate part e.g. coating on surface of substrate helps to minimize chipping and improve device yield as taught by Manor in [0034].

Piwczyk teaches a Nd:YAG laser with a peak power density of 9×10^9 W/cm² for creating micro crack (col. 4, lines 20-40). At the time the invention was made, it would have been obvious to a person having ordinary skill in the art to use a Nd:YAG laser with a peak power density of 9×10^9 W/cm² for creating micro crack teaching of Piwczyk in the laser processing method of Hoekstra because Hoekstra Nd:YAG laser (col. 6, lines 24-30) can be used for a peak power density of 9×10^9 W/cm² for creating micro crack for cutting a substrate.

Umehara teaches applying a stress (col. 3, lines 40-45 e.g. expanding the sheet 10) to the object (10 in Fig. 10 e.g. sheet) which causes cutting the substrate. At the

Art Unit: 2892

time the invention was made, it would have been obvious to a person having ordinary skill in the art substitute Hoekstra's expandable bonding sheet 112 with teaching of Umehara's expanding bonding sheet 10 include a bonding layer 4 in the substrate dividing method of Hoekstra because such bonding layer e.g. layer 4 can be used as a interposed between the IC chips and the lead frame to thereby bond the IC chips to the lead frame thus reduce additional bonding steps as taught by Umehara in (col. 1-10).

Response to Arguments

7. Applicant's arguments with respect to claims 14-19, 21-39, 40-46, 48-52 54-60 have been considered but are moot in view of the new ground(s) of rejection.

8. Applicant's arguments see remarks page 22, filed on 6/30/2010, with respect to nonstatutory obviousness type double patenting have been fully considered and are persuasive. The nonstatutory obviousness-type double patenting rejection has been withdrawn

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

Art Unit: 2892

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELIAS ULLAH whose telephone number is (571)272-1415. The examiner can normally be reached on weekdays, between 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thao Le can be reached on (571) 272-1708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Elias Ullah/
Examiner, Art Unit 2892

/Hoai v Pham/
Primary Examiner, Art Unit 2892

Application/Control Number: 10/507,392
Art Unit: 2892

Page 14